



NASA Astrophysics Division's Joint Technology Prioritization Process

**Presentation at PCOS Town Hall
HEAD 17th Divisional Meeting
March 18, 2019**

PCOS Program Office Technologists

Thai Pham, thai.pham@nasa.gov, 301 286-4809

Opher Ganel, opher.ganel@nasa.gov, 410 440-8029



APD Integrated Technology Prioritization, Solicitation, and Reporting Processes



Beginning this year, the PCOS, COR, and ExEP Program Offices (POs) have integrated our technology gap solicitation, prioritization, and reporting processes to consolidate and streamline efforts and improve ability to:

- Inform the community of APD-wide technology progress and direction
- Communicate strategic technology priorities across all three science Programs
- Promote technology innovation and maturation
- Inform technology planning and investment to maximize strategic impact across APD
- Foster technology cross-utilization



The New Joint Process

- **Joint solicitation of technology gaps from the community:**
 - The three POs are jointly coordinating this year’s technology gap solicitation, prioritization, and reporting cycle on the same schedule
 - This cycle will now be a biennial process (every other year, **starting in 2019**)
 - POs will collect gaps together and determine which Program carries each gap
- **Coordinated prioritization of technology gaps:**
 - Same prioritization criteria and scoring metrics used by all three POs
 - Joint listing of all prioritized Astrophysics gaps published every other year, **starting in 2019**
- **Joint program technology reporting:**
 - Joint publication called the “Astrophysics Biennial Technology Report” or “ABTR” (no more Program Annual Technology Reports, PATRs)
 - The three POs host a common “AstroTech” database of all managed technology projects. Check it out at <http://www.AstroStrategicTech.us/>



Prioritization and Coordination Among Astrophysics Program Offices



- **Technology gap prioritization is changing from Program-science-centric to Astrophysics-wide**
- **Technologists from PCOS/COR/ExEP work together:**
 - Determine for each gap which Program science goals would benefit most from closing it, after which it is prioritized by that Program
 - Technologists from the three POs jointly prioritize gaps for each of the Programs
 - After the three POs complete their prioritization, the technologists merge the three priority lists into a single prioritized Astrophysics technology gaps list
- **Technology gaps will be prioritized by the PCOS and COR Technology Management Boards (TMBs) and the Exoplanet Technology Assessment Committee (TAC) according to a uniform set of criteria**



Uniform Prioritization Criteria

- **Strategic Alignment:** How well does the technology align with astrophysics science and/or programmatic priorities set out in the Astrophysics Implementation Plan, Decadal Survey, or Astrophysics Roadmap?
- **Benefits and Impacts:** How much impact does the technology have on applicable missions? To what degree does it enable and/or enhance achievable science objectives, reduce cost, and/or reduce mission risks?
- **Urgency:** Given the anticipated difficulty of maturing from current TRL of a full solution to TRL 6 assessed against the time available until anticipated launch and/or other schedule drivers, how urgently does the gap need to be addressed?
- **Scope of Applicability:** How crosscutting is the technology? How many Astrophysics programs and/or mission concepts (strategic or other) would benefit by closing the gap?



Need for PhysPAG EC Support Continues



- **Support from PhysPAG EC to review community and STDT submitted technology gaps will be needed, but now be at a biennial cadence**
- **Timing is still the month of June**
- **PhysPAG EC support will be to:**
 - Combine similar or overlapping gaps when it does not make sense to prioritize them separately
 - Refine/update the gaps' information as needed to make them unique, complete, accurate, and compelling
 - Inputs should be submitted as technology capability gaps and not as specific solution implementations
 - Add missing gap(s)
 - Identify gaps to be considered for removal from being prioritized if they:
 - do not require technology development (TRL 6 or higher already, or require engineering solution instead);
 - are duplicates of other gaps;
 - are not sufficiently described or defined; and/or
 - are not relevant to any APD strategic mission
 - Help assign level of complexity for each gap, and difficulty to close it (new request)

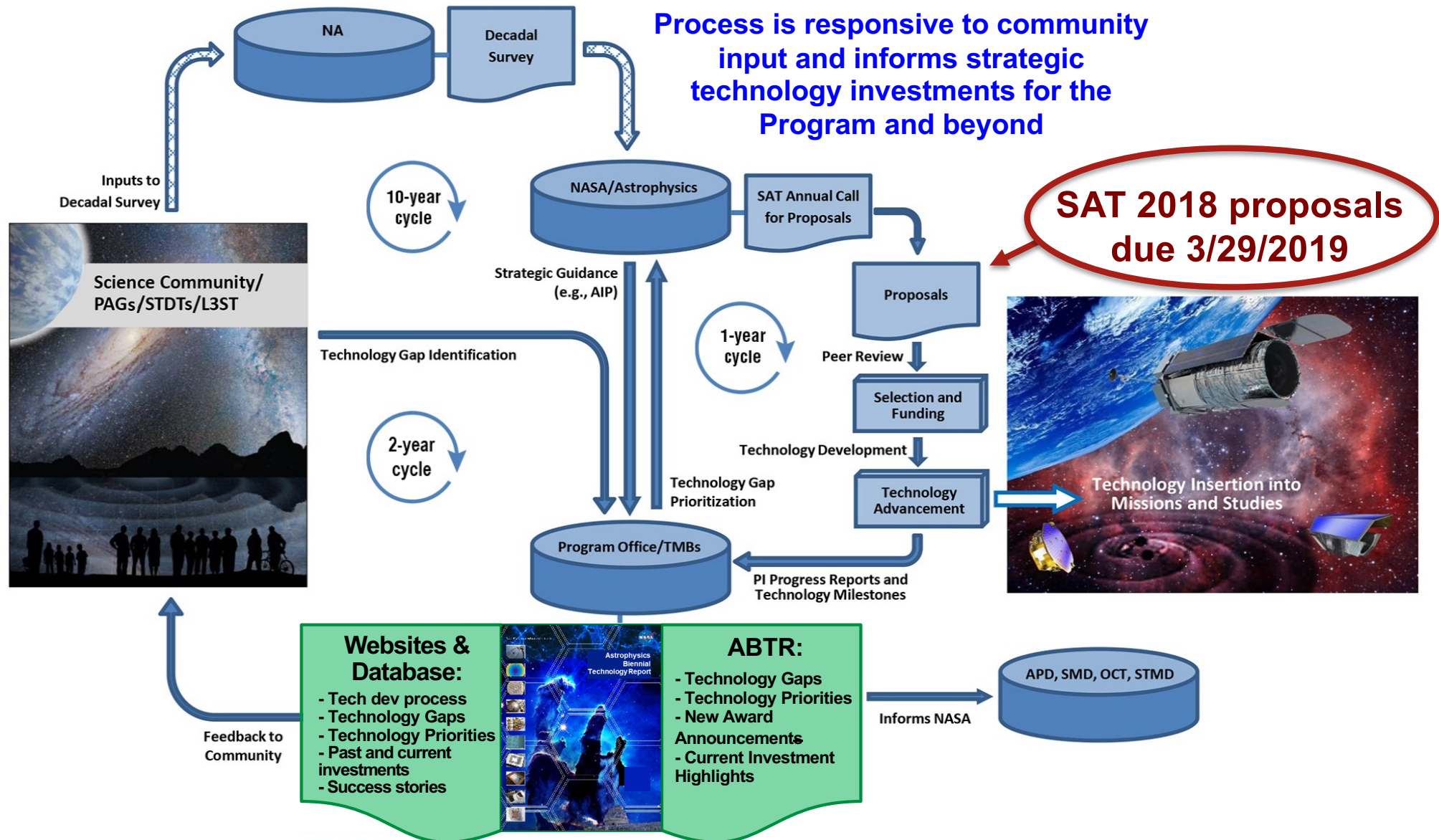


Takeaways



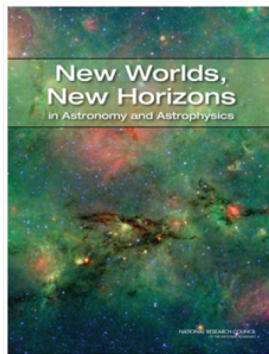
- APD has integrated and streamlined its strategic technology gap solicitation, prioritization, and reporting to better serve the astrophysics community
- A single, high-level, Astrophysics Biennial Technology Report (ABTR) will be published every other year starting in 2019
- PhysPAG EC's much-appreciated review of submitted technology gaps for prioritization will continue every other year during June
- Make your voice heard by submitting strategic technology gaps now through June 1, 2019 for prioritization this year; Download our gap submission form from website address below
- For more information about the PCOS PO technology development program please contact or visit us at <https://apd440.gsfc.nasa.gov/technology.html>

Additional Info

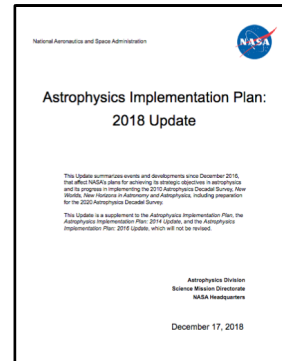


Technology Gap Prioritization Objectives

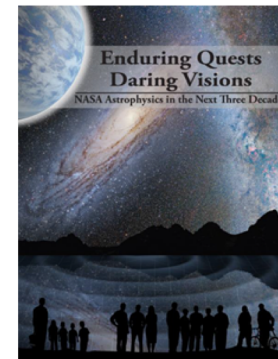
- **Identify technology gaps** applicable and relevant to Astrophysics strategic objectives as described in the Astronomy & Astrophysics Decadal Survey, the Astrophysics Implementation Plan (AIP), and the Astrophysics Roadmap



2010 Decadal Survey



APD Implementation Plan



NASA APD 30 Year Vision

- **Rank technology gaps** to inform APD strategic technology development planning and investments (SAT and directed funding)
- **Inform SAT solicitation** and other NASA technology development programs (APRA; SBIR; and other SMD, OCT, and STMD activities) of our technology needs
- Results inform technology developers of Program needs to help **focus technology development efforts and leverage existing technologies** when possible, and avoid duplicating development efforts
- Process **improves transparency and relevance** of Astrophysics technology investments
- Process **informs and engages the community** to optimize Astrophysics technology development process
- **Leverage technology investments** of other organizations by defining Astrophysics strategic technology gaps and identifying NASA as a potential customer



Strategic Missions and Technology Gaps



Strategic astrophysics missions are ones APD is developing, participating in, or interested in, to respond to high-priority science questions or mandate. These are missions identified as priorities by the current Decadal Survey; identified for execution by APD; and/or that inspired broad community interest, e.g. as captured in the Astrophysics Roadmap. These missions are not competed or PI-led, though they may carry competed instruments developed by PI-led teams.

- Current strategic missions:
 - Missions in formulation or implementation: JWST, WFIRST, Euclid, XRISM
 - Decadal survey mission concept studies: [HabEx](#), [LUVOIR](#), [Lynx](#), [OST](#)
 - Missions identified for potential contributions: LISA, Athena
 - Operating mission with technology needs: [SOFIA](#)
 - CMB Polarization Surveyor per Roadmap and in 2010 DS: [Inflation Probe](#)
 - Visionary missions per Roadmap: [Black Hole Mapper](#), [Cosmic Dawn Mapper](#), [ExoEarth Mapper](#), and [Gravitational Wave Mapper](#)
- Strategic missions relevant for technology gap submission for prioritization are shown above in blue



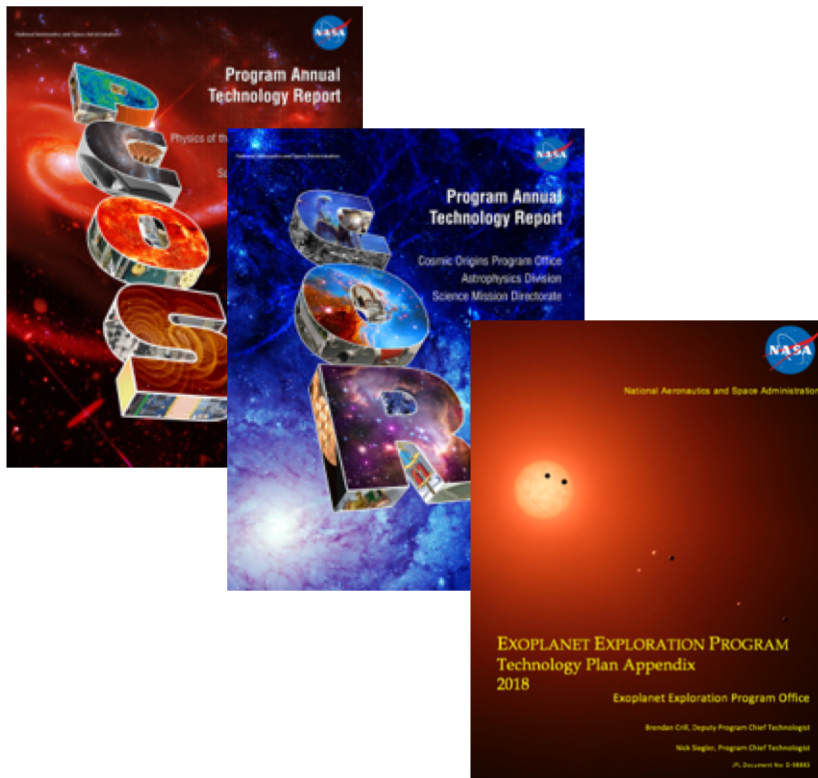
Uniform Technology Gap Prioritization Scoring Guidelines - Draft



Criterion	Weight	Max Score	Max Weighted Score	General Description/ Question	4	3	2	1	0
Strategic Alignment	10	4	40	How well does the technology align with Astrophysics science and programmatic priorities of current programmatic guidance (i.e., AIP, Roadmap, Decadal Survey)?	Technology enables science within mission concept receiving highest current programmatic consideration	Technology enables science within mission concept receiving medium current programmatic consideration	Technology enables science within mission concept receiving low current programmatic consideration	Technology enables science within mission concept mentioned in Decadal Survey but not included in AIP	Technology does not enable science within any mission concept considered by current Astrophysics programmatic guidance
Benefits and Impacts	8	4	32	How much impact does the technology have on applicable mission(s)? To what degree does the technology enable and/or enhance achievable science objectives, reduce cost, and/or reduce mission risks?	Critical and key enabling technology; required to meet mission concept objectives; without this technology mission would not launch or science return would be significantly impaired	Highly desirable; not mission-critical to mission objectives, but significantly enhances science capability, reduces critical resources needed, and/or reduces mission risks; without it, missions may launch, but science return would be compromised	Desirable - not required for mission success, but offers moderate science or implementation benefits; if technology is available, would almost certainly be implemented in mission	Minor science impact or implementation improvements; if technology is available would be considered for implementation in mission	No science impact or implementation improvement; even if available, technology would not be implemented in mission
Urgency	5	4	20	Given anticipated complexity and "length" of gap (informed by relevant ongoing efforts), assessed against the time available until anticipated launch and/or other schedule drivers, how urgently does the gap need to be addressed?	Estimated schedule margin of 0% or less (i.e., negative)	Estimated schedule margin is greater than 0% and less than or equal to 20%	Estimated schedule margin is greater than 20% and less than or equal to 40%	Estimated schedule margin is greater than 40% and less than or equal to 60%	Estimated schedule margin is greater than 60%
Scope of Applicability	2	4	8	How cross-cutting is the technology? How many Astrophysics programs and/or mission concepts (including Explorers and Probes) could it benefit?	Applies to more than one high-priority strategic Astrophysics mission concepts	Applies to one high-priority strategic Astrophysics mission concept and one or more other strategic mission concepts	Applies to more than one strategic Astrophysics mission concept	Applies to just one strategic Astrophysics mission concept and at least one non-strategic Astrophysics mission (e.g., Explorers, Probes, etc.)	Applies to only one strategic Astrophysics mission, or one or more non-strategic missions

POs Annual Report Contents Moved into ABTR and Websites

Was three reports annually
(with websites in support role)



Will be:

**One report
biennially
starting 2019**
(cover mockup shown)



**Websites & Database
playing major role**



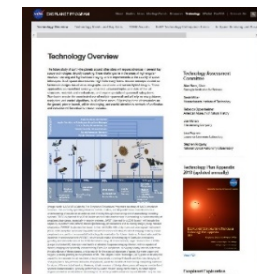
PCOS/COR
technology

apd440.gsfc.nasa.gov/technology



AstroTech
searchable
database
for PCOS,
COR, and
ExEP

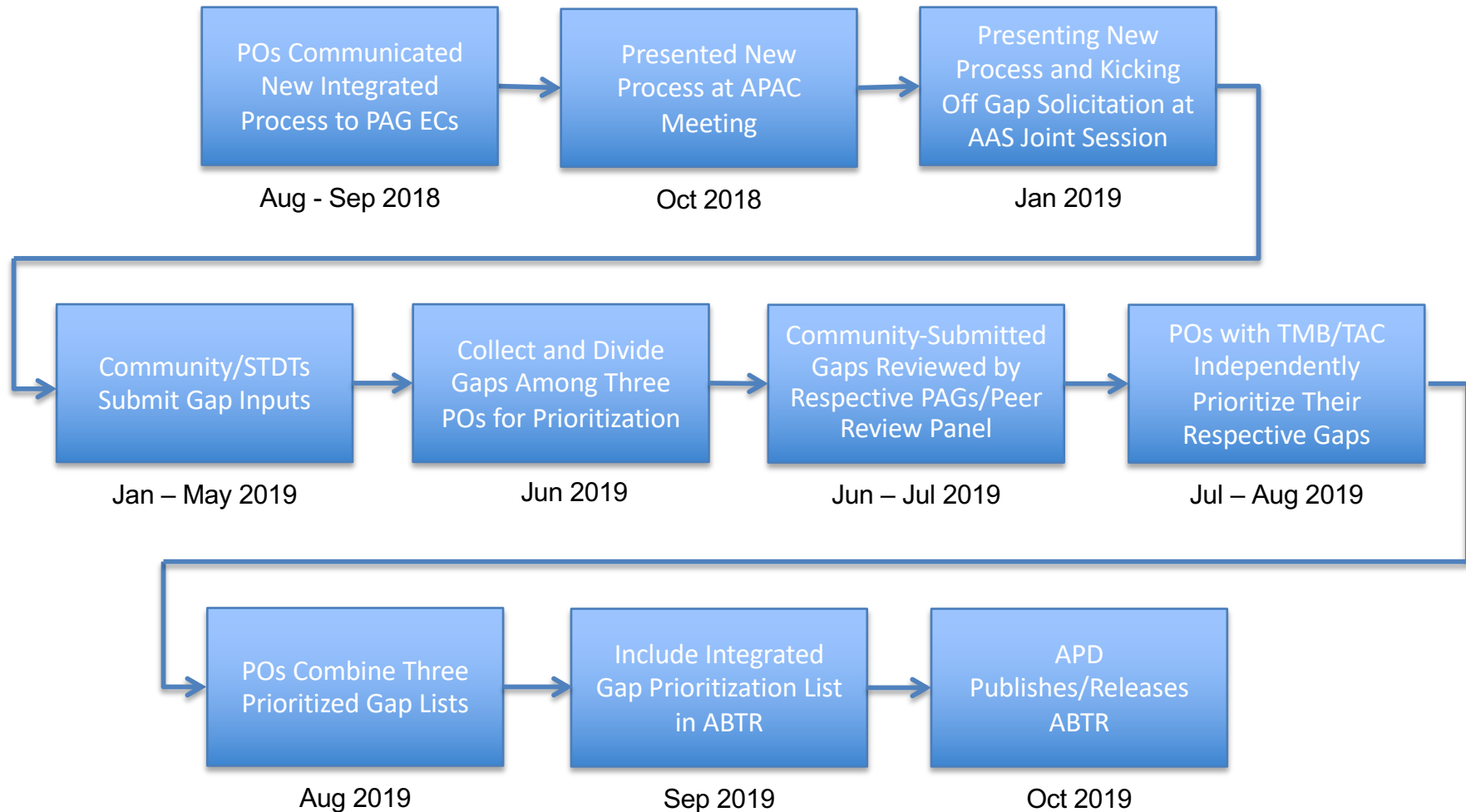
www.astrostrategictech.us/



ExEP
technology

exoplanets.nasa.gov/exep/technology

Schedule for New Joint Process





Technology Gap Input Form

Gap input form can be downloaded from
https://apd440.gsfc.nasa.gov/technology/gap_form.docx

Astrophysics Technology Capability Gap Input Form		
<u>Technology Capability Gap Name:</u>		<u>Date Submitted:</u>
<u>Submitter Name:</u>	<u>Organization:</u>	
<u>Telephone:</u>	<u>Email Address:</u>	
Prioritization Information (see accompanying instructions)		
<u>Identify Strategic Missions Enhanced or Enabled by Closing this Technology Gap:</u>		
<input type="checkbox"/> HabEx <input type="checkbox"/> LUVOIR <input type="checkbox"/> Lynx <input type="checkbox"/> OST <input type="checkbox"/> SOFIA <input type="checkbox"/> IP <input type="checkbox"/> BH Mapper <input type="checkbox"/> Cosmic Dawn Mapper <input type="checkbox"/> Exo-Earth Mapper <input type="checkbox"/> GW Mapper <input type="checkbox"/> Other: _____		
<u>Brief Description of the Technology Capability Needed (100 – 150 words):</u>		
<u>Assessment of the current State-of-the-Art (SOTA) and references justifying TRLs quoted at right (100 – 150 words):</u>		<u>Current TRL of SOTA:</u> <u>Current TRL of Full Solution:</u>
<u>Technical Goals and Objectives to Fill the Capability Gap:</u>		
<u>Scientific, Engineering and/or Programmatic Benefits (100 – 150 words):</u>		
<u>Applications and Potential Relevant Missions for Astrophysics Division:</u>		
<u>Urgency (time to estimated launch or other schedule driver vs. estimated complexity – i.e. time and cost to close the gap):</u>		



SAT Stats



Solicitation Year	SAT Proposals		Selection Rate
	Submitted	Awarded	
2009	34	7	21%
2010	57	17	30%
2011	50	10	20%
2012	40	9	23%
2013	18	10	56%
2014	28	11	39%
2015	29	7	24%
2016	30	9	30%
2017	25	11	44%
Total to Date	311	91	29%

Solicitation Year	TDEM SAT Proposals		Selection Rate
	Submitted	Awarded	
2009	34	7	21%
2010	22	9	41%
2011	Not solicited	NA	NA
2012	17	3	18%
2013	10	4	40%
2014	8	3	38%
2015	7	1	14%
2016	6	3	50%
2017	10	3	30%
Total to Date	114	33	29%

Solicitation Year	PCOS SAT Proposals		Selection Rate
	Submitted	Awarded	
2010	21	5	24%
2011	26	5	19%
2012	10	3	30%
2013	8	6	75%
2014	6	3	50%
2015	10	4	40%
2016	5	2	40%
2017	4	3	75%
Total to Date	90	31	34%

Solicitation Year	COR SAT Proposals		Selection Rate
	Submitted	Awarded	
2010	14	3	21%
2011	24	5	21%
2012	13	3	23%
2013	Not Solicited	NA	NA
2014	14	5	36%
2015	12	2	17%
2016	19	4	21%
2017	11	5	45%
Total to Date	107	27	25%